

Integrated CubeSat ADACS with Reaction Wheels and Star Tracker, Phase I

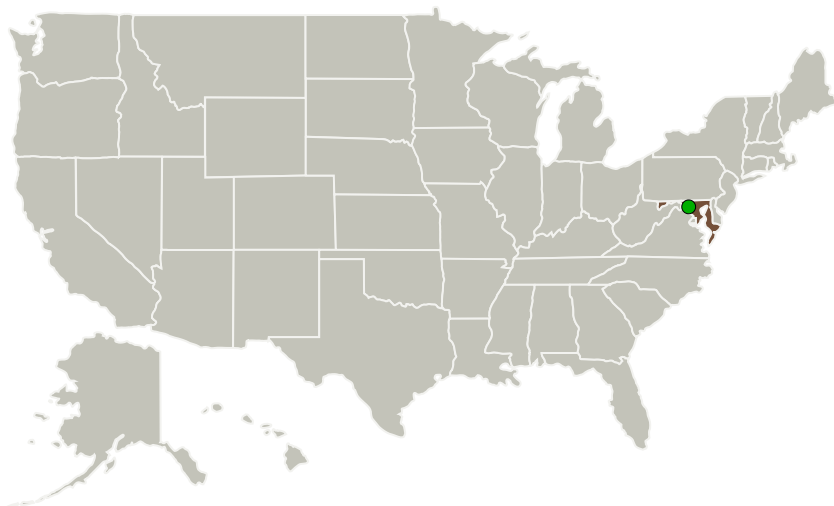
Completed Technology Project (2012 - 2012)



Project Introduction

A high performance ADACS (Attitude Determination and Control System) for CubeSats incorporating Miniature Star Trackers is proposed. The proposed program will focus on development and integration of 2 Star cameras into the MAI-400 which is the current state of the art nanosat ADACS and is marketed by our company. The resulting product will feature 2 Star Trackers, 3 axis reaction wheels, electromagnets, sun sensors and magnetometer, all within a SWAP (Size, Weight and Power) envelope of 1/2U, 0.7 kg and 2.5W, which is responsive to the needs of the next generation of CubeSats. The new product, called MAI-400SS Space Sextant, enables precision attitude control (better than 0.05deg) as will be required for Space Weather, Cosmological Science and Earth Imaging missions. The Star Tracker system is entirely autonomous and features Lost In Space star identification which associates observed stars with corresponding catalog stars without any apriori attitude information. A MEMS gyro facilitates Kalman filtering of an attitude solution and frame to frame tracking of stars. A program for development of the cameras, electronics, and processing software is outlined which leverages a previous Star Tracker development project by our firm. The technology is significant because it extends the capability of current low cost CubeSats to high resolution imaging and other missions requiring precision fine pointing and dynamic retargeting, which were hitherto restricted to \$100M spacecraft. The new MAI-400SS will facilitate rapid development of low cost satellites by providing a turnkey system which would be capable of determining spacecraft attitude automatically; speeding integration and simplifying operations.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Adcole Maryland Aerospace, LLC	Lead Organization	Industry	Crofton, Maryland
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Project Transitions

**February 2012:** Project Start**August 2012:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140293>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Adcole Maryland Aerospace, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

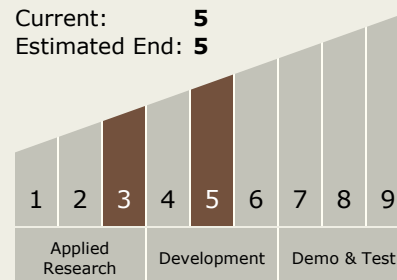
Carlos Torrez

Principal Investigator:

Steve Fujikawa

Technology Maturity (TRL)

Start: 3
Current: 5
Estimated End: 5



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Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
 - └ TX17.4 Attitude Estimation Technologies
 - └ TX17.4.3 Attitude Estimation Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System